CONNECTICUT
DEPARTMENT OF TRANSPORTATION

STATE PROJECT NO. 92-669

Rehabilitation of Bridge 03014A I-91 NB over Mill River, State Street, Ramp 140

Design Inspection Memo

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Dewberry Engineers Inc.
Design Inspection Memo

Bridge No. 03014A
I-91 NB over Mill River, State Street & I-91 NB Ramp 140
New Haven, CT
Project No. 92-669

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Summary of Inspection Findings

Dewberry Engineers Inc. preformed an in-depth inspection of the steel framing of Bridge 03014A in New Haven, CT. in accordance with the scope of work between 6/23/2014 and 7/15/2014. The following is a summary of our findings.

- The SIP forms at the deck end haunch exhibit areas with heavy rust and perforations, up to 6' long by 1' wide at approximately 60 locations. See Photo 5 and framing plan field notes.
- The SIP forms are also deteriorated at isolated locations other than at the deck end haunch, with the largest area being in Span M, Bay 7 which exhibits 100% deterioration. See Photo 6 and framing plan field notes.
- All scupper drain pipes exhibit heavy laminated rust and isolated drain pipes have PVC sleeves installed around the deteriorated pipes at random locations. See Photos 7 and 8.
- The scupper grates along the west curb in Spans A and J are fully clogged. See Photo 9.
- There is section loss in the bottom of the web at majority of the girders ends. The typical section loss measures 3' long x 4" high x up to 3/16" deep. See Photos 10 – 12 and field notes.
- Three new perforations up to 3 1/2" long x 1" high were found in G9, Span J, near Pier 10. See Photo 13 and field notes.
- The webs at girder ends are bowed by up to 7/8" (typically at the bottom 1/3rd of the web) at approximately 30 locations (in 10 of the 15 spans, but mainly in Spans J, K, L and M). See Table 1, Photo 14 and field notes.
- The girder ends are tipped by up to 1/2" over 2' at approximately 60 locations (in 13 of the 15 spans). At a majority of these locations, there is heavy impacted rust between the bearing plates. See Table 2, Photos 15 & 16 and field notes.
- There is section loss present on the top of the bottom flange in majority of the beams. The typical section loss measures 3' long x full width of flange x 1/8" deep. At random locations, the section loss measures up to 1/4" deep. See Photos 10 & 17 and field notes.
- Cracked/missing welds were observed at the following locations (see Photos 18 – 21 and field notes):
    - Span B, east side of G1, near Pier 2 – cracked weld between the connection plate for scupper pipe and top flange
    - Span J, G3 at Pier 9 – cracked weld between lower connection plate and vertical stiffener connection at the end diaphragm
    - Span M, west side of G2 near Pier 12 – cracked weld between the connection plate and the top flange at the first interior diaphragm.
    - Span I, west side G3 near Pier 9 - missing weld between the connection plate and the top flange at the first interior diaphragm.

    - Span M, east side of G9 & west side of G10 near Pier 12 - missing weld between the first interior diaphragm and the connection plate.

- The end diaphragms typically exhibit 1/16" deep painted over section loss on the channel web and flanges. Random locations exhibit active corrosion areas with section loss up to 3/16" deep, knife edges and perforations. See Photos 22 & 23 and field notes.
- The fixed bearings typically exhibit up to 3/8” impacted rust between the sole plate and the masonry plate. All anchor bolts have been cut/removed and plated over. Fixed bearings at two locations (Span D, G7 at Pier 3 and Span H, G8 at Pier 7) exhibited excessive movement under live loading with the presence of abrasion rust. See Photos 24 & 25 and field notes.
- The paint system has failed throughout. See Photos 27 & 28 and field notes.
- There are multiple disconnected conduits with exposed wires attached to the south side of Pier 13. There are utility conduits welded to the bottom flanges in Span M near Pier 13 resulting in fatigue prone details. See Photos 29 and 30 and field notes.

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Job Number: 500645530
Job Description: BR 03014A I-91NB
Notes by: RFP Date: 8/22/2014
Checked by: PHH Date: 8/29/2014

TABLE 1 - LIST OF BOWED MEMBERS

Span	Substructure Unit	Member #	Magitude of Bowing	Direction
B	P2	1	3/16" over 2'	East
D	P4	1	1/8" over FH	East
D	P4	3	1/8" over FH	East
F	P5	1	1/8" over FH	West
F	P6	1	1/8" over FH	West
G	P6	1	1/8" over FH	West
H	P8	11	3/8" over 2'	East
I	P8	1	1/4" over FH	West
J	P10	2	5/8" over 10"	West
J	P10	4	7/8" over 1'	West
J	P10	9	3/4"	East
K	P11	4	1/8" over 2'	East
K	P11	7	1/4" over 1'	East
K	P11	9	1/8" over 1'	East
K	P11	12	3/16" over 2'	West
K	P11	13	1/4" over 2'	West
K	P11	14	3/16" over 2'	East
L	P11	2	1/4" over 2'	East
L	P11	3	3/16" over 2'	East
L	P11	4	1/16" over 2'	West
L	P11	8	1/8" over 2'	East
L	P11	10	1/8" over 2'	West
L	P11	12	3/16" over 2'	West
L	P11	14	1/4" over 2'	West
L	P11	15	5/16" over 2'	East
L	P12	1	1/8" over 2'	West
L	P12	6	3/16" over 2'	West
L	P12	9	5/16" over 2'	East
L	P12	10	1/4" over 2'	East
L	P12	11	1/4" over 2'	East
L	P12	13	1/4" over 2'	West
L	P12	15	3/8" over 2'	East
L	P12	16	1/8" over 2'	East
M	P12	2	3/16" over 2'	West
M	P12	11	1/4" over 2'	East
M	P12	13	1/4" over 2'	West
M	P12	14	1/4" over 2'	West
M	P12	17	1/4" over 2'	East
M	P12	18	7/16" over 2'	East
M	P13	7	1/4" over 2'	East

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TABLE 2 - LIST OF TIPPED MEMBERS

Span	Substructure Unit	Member #	Magitude of Tipping	Direction
A	S. Abut.	13	7/16" over 2'	East
A	P1	10	9/16" over 2'	East
B	P1	4	1/4" over 2'	West
B	P2	2	1/8" over 2'	West
B	P2	5	1/4" over 2'	East
B	P2	10	1/8" over 2'	West
B	P2	15	7/16" over 2'	East
C	P2	1	3/16" over 2'	East
C	P2	7	3/16" over 2'	East
C	P2	12	1/4" over 2'	East
C	P2	15	3/16" over 2'	East
C	P2	17	9/16" over 2'	East
C	P3	1	1/2" over 2'	West
C	P3	13	1/4" over 2'	West
D	P4	10	1/4" over 2'	East
E	P4	2	3/16" over 2'	West
E	P4	3	1/8" over 2'	East
E	P4	4	1/4" over 2'	East
E	P5	6	1/4" over 2'	West
E	P5	7	1/4" over 2'	West
F	P5	12	1/4" over 2'	East
F	P6	2	1/8" over 2'	East
F	P6	10	1/8" over 2'	East
G	P6	4	1/8" over 2'	West
G	P7'	1	1/8" over 2'	East
H	P7'	8	3/16" over 2'	West
I	P8	7	3/16" over 2'	East
I	P8	8	1/8" over 2'	East
I	P8	10	3/16" over 2'	East
I	P9	10	1/4" over 2'	East
I	P9	11	1/4" over 2'	East
I	P9	12	1/4" over 2'	East
J	P9	7	3/16" over 2'	East
J	P9	9	1/8" over 2'	East
J	P10	3	3/16" over 2'	East
J	P10	5	1/8" over 2'	East
J	P10	7	1/8" over 2'	East
J	P10	8	1/4"over 2'	East
J	P10	9	1/4"over 2'	East
K	P10	2	3/16" over 2'	West
K	P10	7	1/8" over 2'	East
K	P10	14	1/8" over 2'	East
K	P11	2	1/8" over 2'	East
K	P11	5	3/16" over 2'	East
K	P11	10	1/8" over 1'	East

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TABLE 2 - LIST OF TIPPED MEMBERS

Span	Substructure Unit	Member #	Magitude of Tipping	Direction
L	P11	1	1/8" over 2'	West
L	P11	4	3/8" over 2'	East
L	P11	5	1/8" over 2'	East
L	P11	9	3/16" over 2'	East
L	P11	13	3/16" over 2'	West
L	P11	16	1/4" over 2'	East
L	P12	3	3/16" over 2'	West
L	P12	8	3/8" over 2'	West
L	P12	14	1/4" over 2'	East
M	P12	1	3/16" over 2'	West
M	P12	9	3/16" over 2'	West
M	P12	12	3/8" over 2'	West
M	P13	2	3/16" over 2'	East
M	P13	4	1/4" over 2'	West
M	P13	5	3/16" over 2'	West

Bridge No.	03014A	**Inspected by:**	Randolph F. Pareja
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Feature Crossed:	Mill River, State Street, Ramp 140	**Project No.:**	92-669

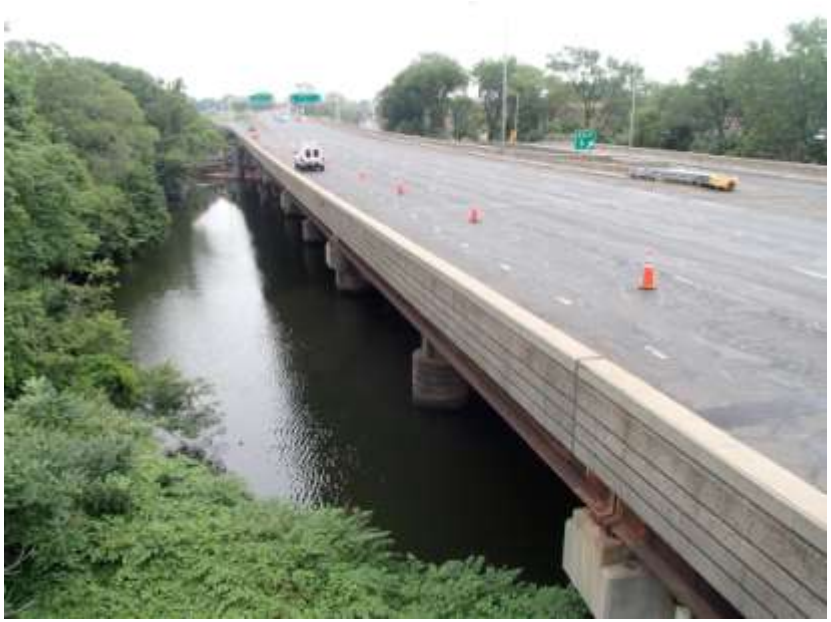

Photo # 1: West elevation of the bridge, south half shown.

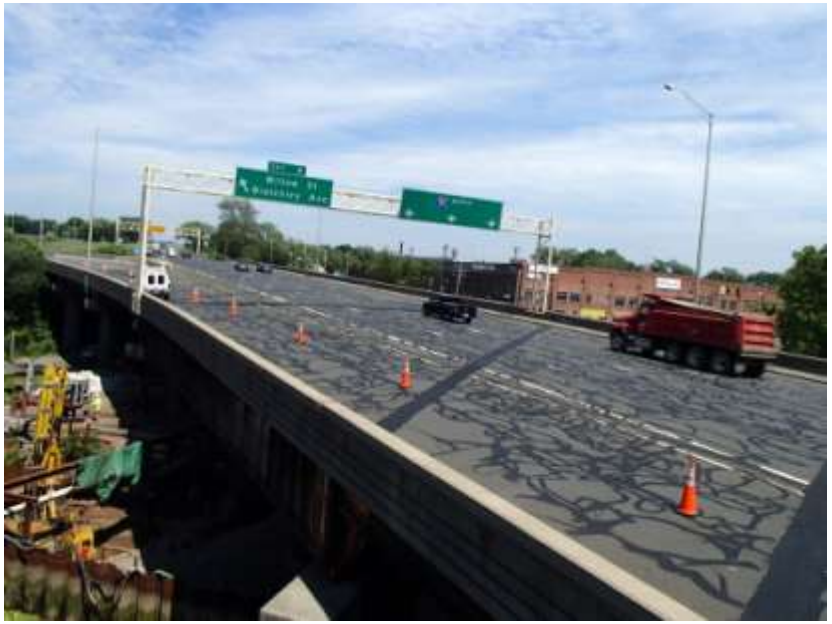

Photo # 2: West elevation of the bridge, north half shown.

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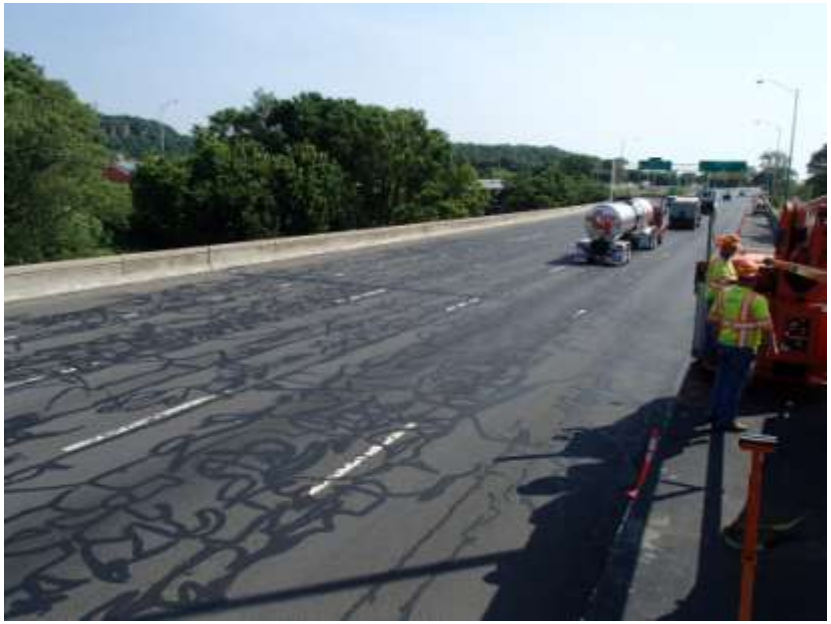

Photo # 3: General view of top of deck.

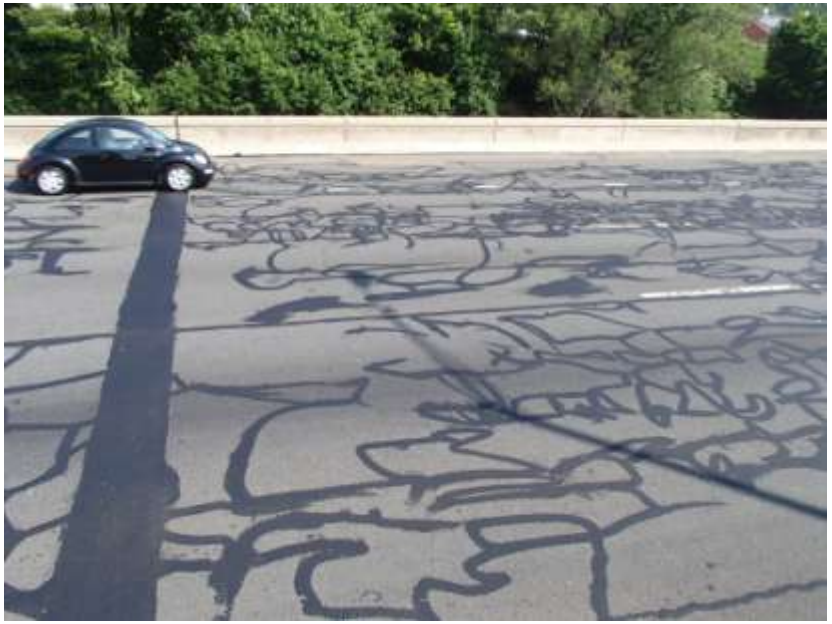

Photo # 4: Typical pavement condition.

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Photo # 5: Typical condition of SIP form at end diaphragm with active corrosion. Note the 5' long x 1' wide area of heavy rust with perforation holes.

Photo # 6: Underside of deck between G7 and G8 in Span M exhibits 100% deterioration of SIP forms.

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Photo # 7: Typical condition of scupper drain pipes with heavy laminated rust. Also note area of heavy rust to SIP forms around the scupper drain.

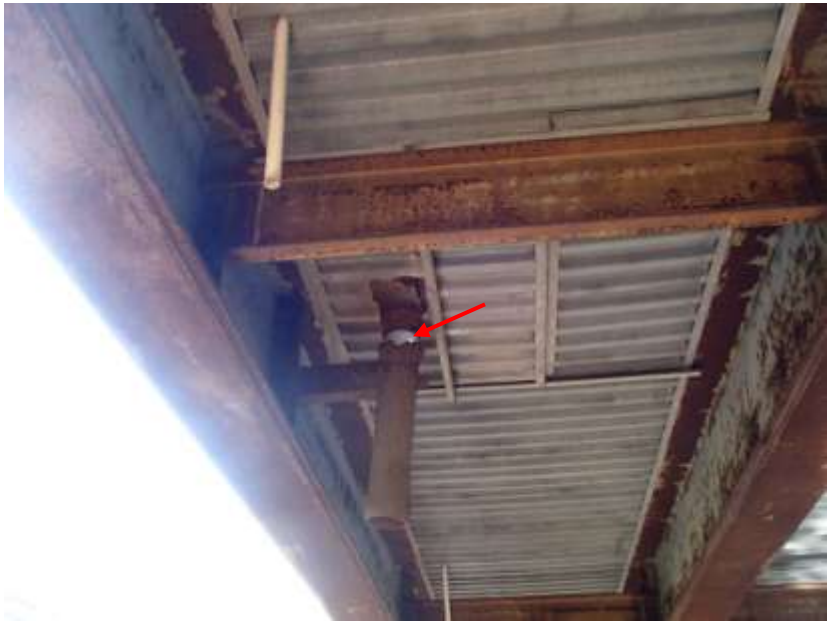

Photo # 8: Broken and disconnected scupper drain pipe in Span D adjacent to G11.

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Photo # 9: Fully clogged scupper grate at the west curb in Span J.

Photo # 10: In Span I, at Pier 8, the east side of G4 exhibits 2'-6" long x 5" high x 3/16" deep section loss at the bottom of the web. Also note the section loss to the top of the bottom flange, 3' long x full width x 1/8" deep.

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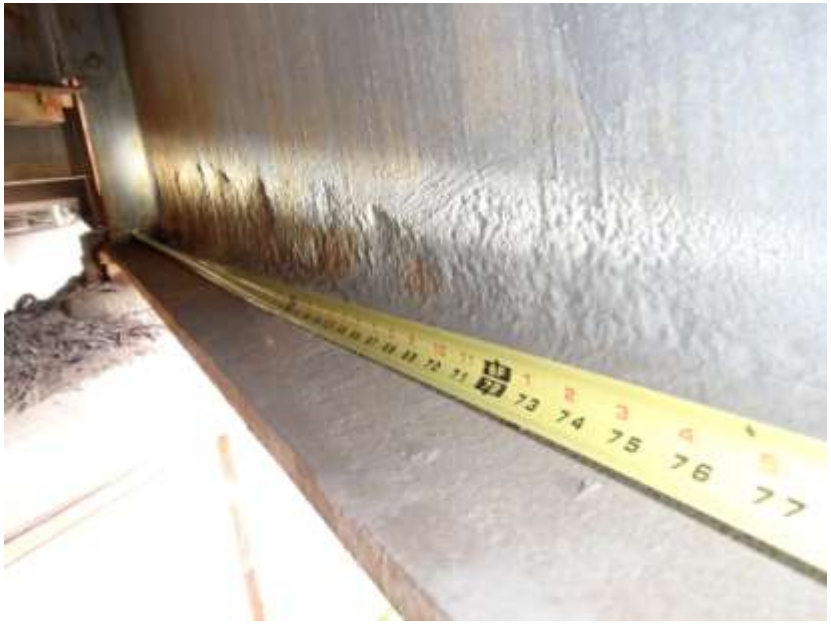

Photo # 11: In Span K, at Pier 11, the west side of G14 exhibits 6'-6" long x 7" high x 3/16" deep section loss at the bottom of the web.

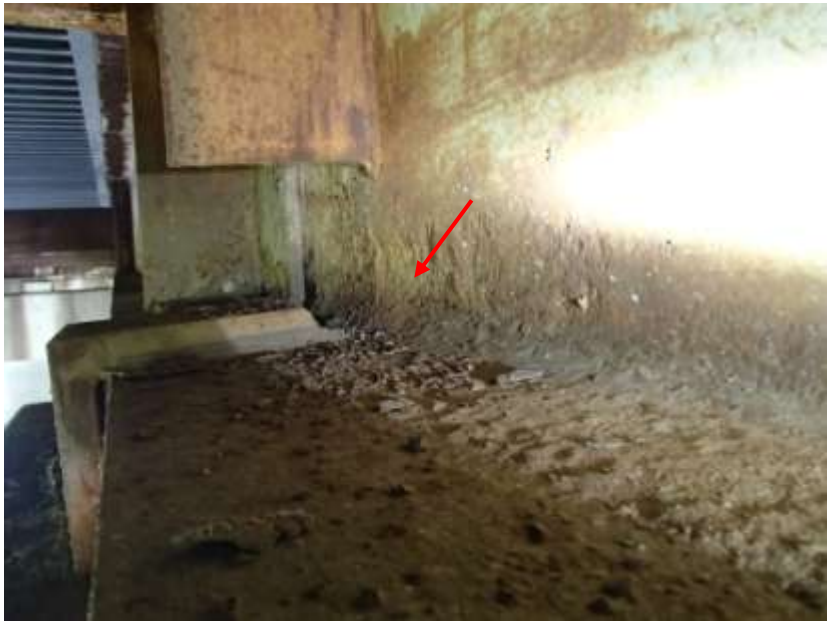

Photo # 12: In Span B, at Pier 2, the west side of G7 exhibits 2' long x 5" high x 1/8" deep section loss at the bottom of the web.

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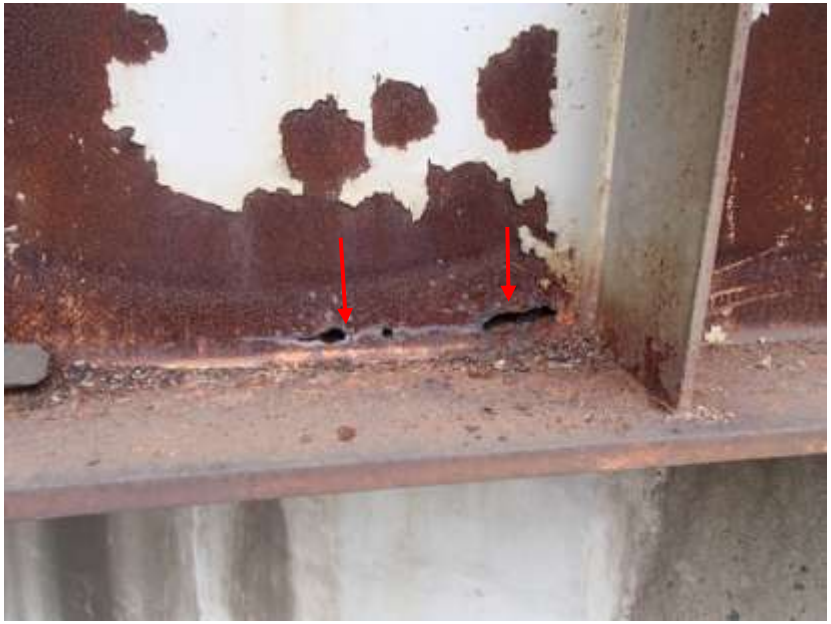

Photo # 13: In Span J, at Pier 10, G9 exhibits three perforations to bottom of the web up to 3 ½" long x 1" high.

Photo # 14: In Span J, at Pier 10, G9 exhibits a 2' long x 10" high x ¾" deep bow in the bottom of the web.

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Photo # 15: In Span B, at Pier 2, G15 is tipped east 7/16" over 2'.

Photo # 16: In Span C, at Pier 3, G1 is tipped west 1/2" over 2'.

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Photo # 17: In Span H, at Pier 8, G7 exhibits ¼" deep section loss to the bottom flange.

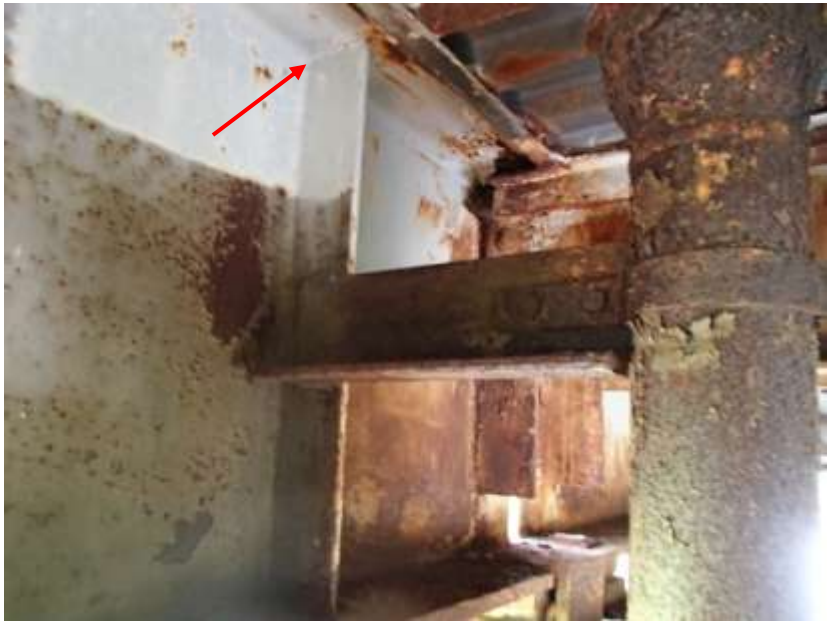

Photo # 18: General view of the cracked weld between the top flange and the connection plate in Span B, near Pier 2, on the east side of G1.

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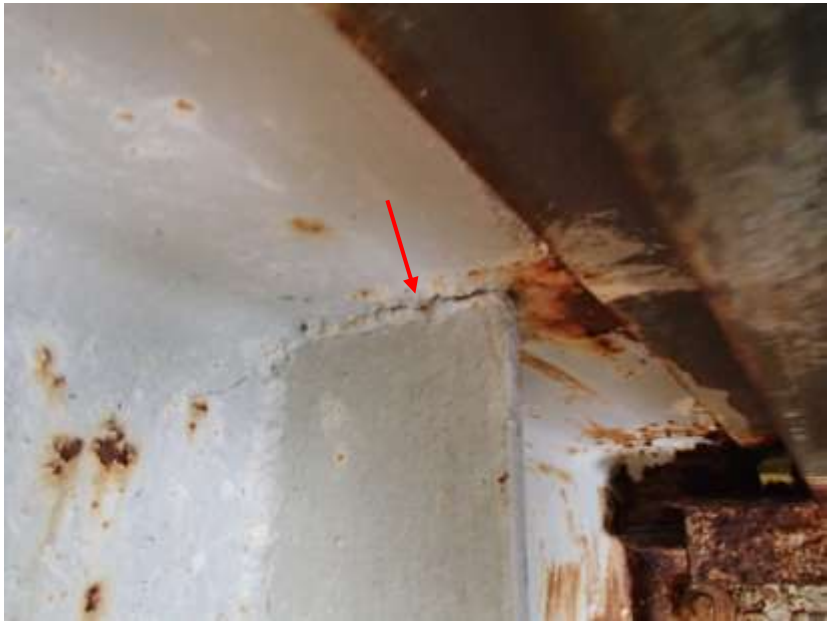

Photo # 19: Close up view of Photo 18.

Photo # 20: Close up view of the cracked weld between the top flange and the connection plate at the first interior diaphragm in Span M, near Pier 12, on the west side of G2.

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Photo # 21: Missing weld between the connection plate and the top flange at the first interior diaphragm in Span I, near Pier 9, on the west side of G3.

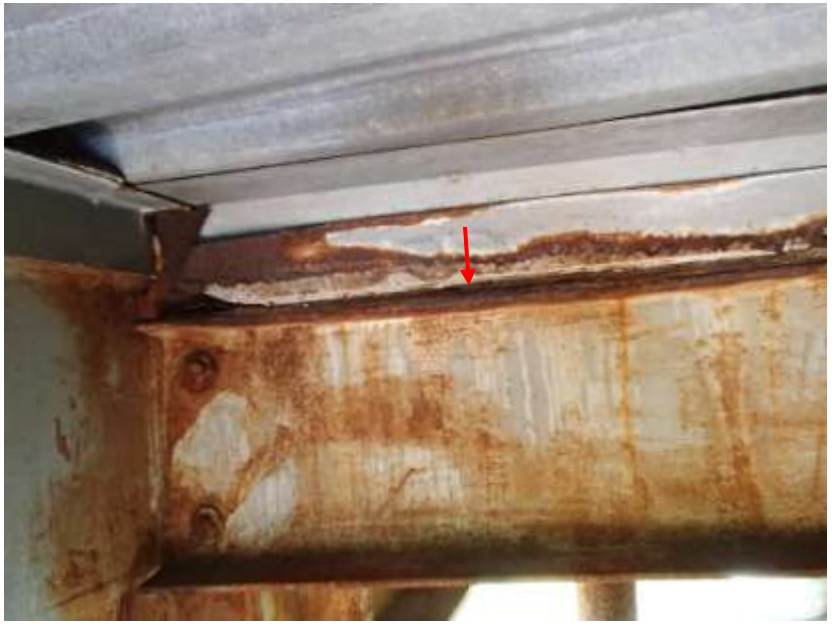

Photo # 22: End diaphragm in Span C, at Pier 2, in Bay 16 exhibits 3' long x 3" wide x 3/16" deep section loss to the top flange and ¾" impacted rust between the top flange and SIP form.

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Photo # 23: End diaphragm in Span M at Pier 12 in Bay 7 exhibits heavy deterioration with a maximum of 1/8" remaining to flanges and web. Also note ¾" diameter perforation in the web.

Photo # 24: Typical condition of the fixed bearings with up to 3/8" impacted rust between sole plate and masonry plate. Also note that the anchor bolts have been cut/removed at all fixed bearings and plated over.

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Photo # 25: Fixed bearing under G7 in Span D at Pier 3 exhibits excessive movement under live load with the presence of abrasion rust.

Photo # 26: Typical condition of the expansion bearings.

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Photo # 27: The paint system has failed, Span N shown.

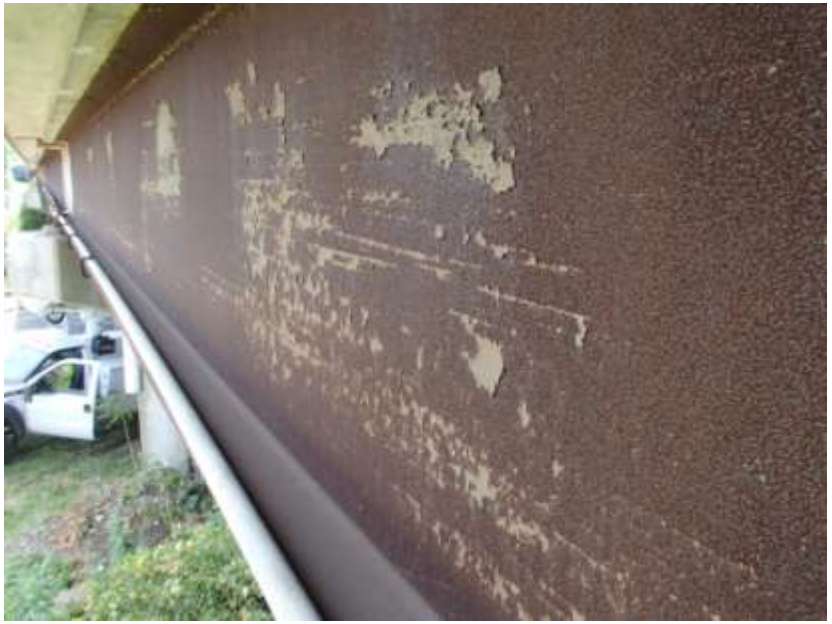

Photo # 28: The paint system has failed, Span O shown.

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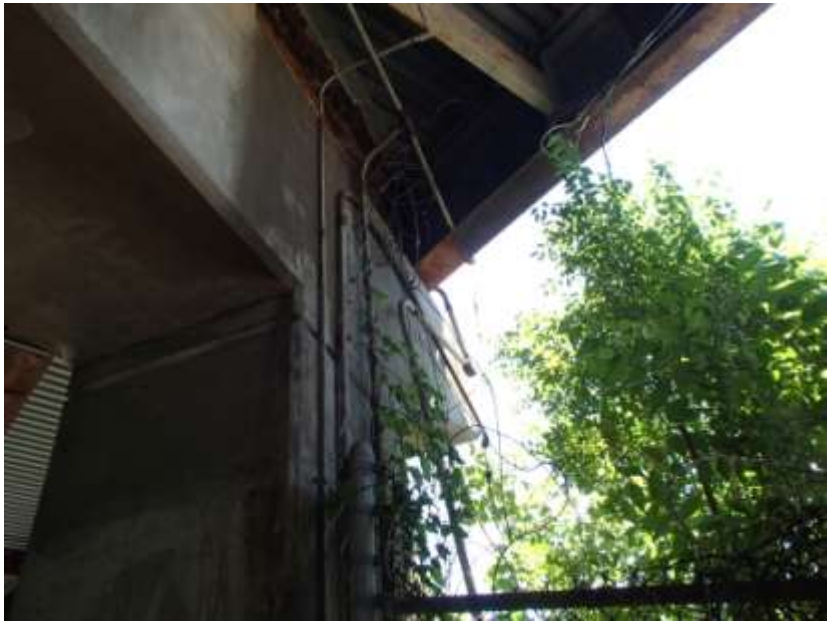

Photo # 29: Multiple disconnected conduits with exposed wires at the south side of Pier 13.

Photo # 30: Utility conduits welded to the bottom flanges in Span M, near Pier 13.